

Plynops, a Peculiar New Genus and Ten New Species in the Tribe Euphorini (Hymenoptera: Braconidae: Euphorinae)

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Abstract.—*Plynops* Shaw, a new genus in the tribe Euphorini, is described and illustrated. The genus is characterized by bizarre modifications of the female head, which are hypothesized to be adaptations for host manipulation. The phylogenetic affinities of the genus are examined and a sister-group relationship with *Cryptoxilos* Viereck is hypothesized. Ten new species of *Plynops* are described: *braziliensis*, *carinatus*, *edwardi*, *falcatus*, *hansoni*, *masoni*, *megakephalos*, *minutus*, *pilatus*, and *riedeni*. A key to species is given, and phylogenetic relationships among the species are briefly discussed.

INTRODUCTION AND HISTORICAL REVIEW

For several years the existence of an unusual new euphorine genus with bizarre head modifications (Figs. 1, 5-21) has been known among North American braconidologists, but until now the genus has not been described or discussed in the literature. The purpose of this paper is to describe the genus, so that it may be included in the *Identification Manual for New World Genera of the Family Braconidae*, currently in production.

The earliest known specimens of this genus (three males) were collected by Fritz Plaumann in Nova Teutonia, Brazil, in 1940 and 1941, but their significance was not recognized until recently. Two specimens were sent to the British Museum (Natural History) in London, where they were accessioned in 1957, and another was sent to the Canadian National Collection at Ottawa. However, these specimens remained essentially lost in the collections until they were recently rediscovered and sent to me by Drs. D. Quicke and M. Sharkey, respectively.

The first person apparently to recognize the identity of this taxon as a new genus

was Mr. C.F.W. Muesebeck, working at the U.S. National Museum in the 1950s. A single female specimen was reared from *Canavalia* seeds in Nogales, Mexico, in May of 1953, and was later sent to Mr. Muesebeck for identification. The specimen now bears his identification label as "n.g. near *Euphorus*" (a junior synonym of *Leiophron*). However, Mr. Muesebeck did not publish on the new genus and species, and subsequently the Mexican specimen was loaned to Dr. W.R.M. Mason at the Canadian National Collection, at Ottawa.

Many years later, early in 1984, I was fortunate to visit the Canadian National Collection where I met Dr. Mason and he showed me specimens of this remarkable genus. By that time he had accumulated only three more specimens, representing two more new species from Ecuador. He indicated to me that he had known about the new genus for many years, but had delayed publishing on it because of the scarcity of specimens. We examined the specimens together and we both agreed that the new genus very closely resembled *Cryptoxilos* Viereck in the form of the petiolar sculpturing (Figs. 2, 4), wing venation (Fig. 22), and ovipositor structure, but

that the head morphology was bizarrely apomorphic (with the face deeply concave and densely lined with setae, mandibles enlarged and hooked, and with unusual protruberances below the antennae). Dr. Mason indicated that he had coined a manuscript name for the new genus, which he called *Plynops*. Since he indicated to me that he planned to eventually publish on the new genus, I did not include the taxon in my subsequent studies of the Euphorinae (Shaw, 1985, 1987).

A few years later, around 1989, I began a collaboration with Prof. Paul Hanson, of the Universidad de Costa Rica, to help develop a textbook to the *Hymenoptera of Costa Rica*. As a result of this effort, dozens of Malaise traps were operated at sites throughout the country, and many thousands of specimens of Braconidae were collected and prepared for study. One of the unexpected surprises of this project was the accumulation of several additional new species of this new euphorine genus, in substantially greater numbers than had previously been seen elsewhere. For the first time, a description of the genus based on substantial specimen series seemed possible.

In 1991 I contacted Dr. Mason about this project, and we agreed to collaborate on the description of this new genus. However, due to his untimely death late in 1991, our plans for a joint paper were circumvented. Later, Dr. M. Sharkey sent me all the specimens he was able to locate, but no manuscript was discovered. Consequently, I've endeavored to describe this new genus and ten included species. Other than adopting Bill Mason's proposed name for the genus, my work presented here is completely original. One new species included here is named as a patronym in honor of Dr. Mason, for his numerous contributions to the study of the Hymenoptera.

METHODS

The morphological terminology used here follows that of Shaw (1985, 1987), ex-

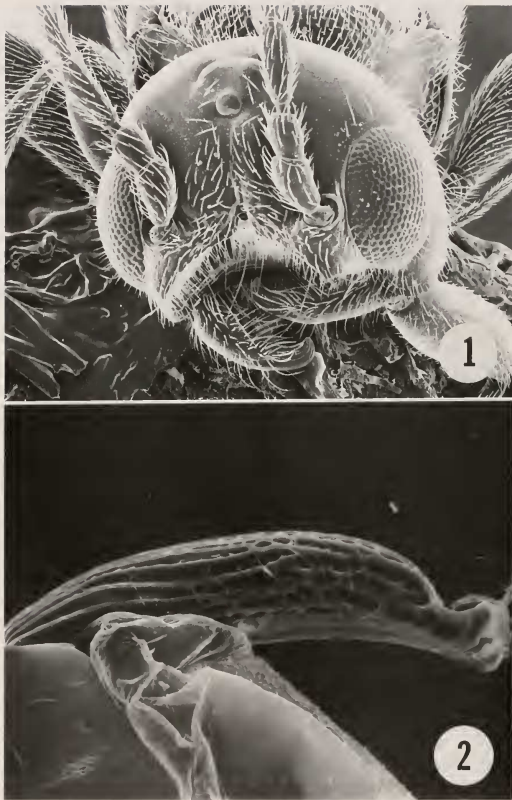
cept for the wing venation terminology, which is adapted to conform to more recently adopted changes (Huber & Sharkey, 1993). To facilitate comparison with previous work, the wing venation terms of Shaw (1985) are given parenthetically in the descriptive section. Body length was measured from the front of the head to the apex of the metasoma, exclusive of the antennae and ovipositor. Ovipositor length was measured, in lateral view, relative to the length of the metasoma exclusive of the ovipositor. Acronyms for collections are given in the acknowledgments section.

Figs. 3–10 were done using the Environmental Scanning Electron Microscope at the Western Research Institute. Uncoated specimens were examined at operating voltages of 11–19 kV.

To examine the phylogenetic placement of the new genus, the taxon was coded for the 45 phylogenetically-informative characters examined by Shaw (1987) and added to the matrix for the tribe Euphorini (see tables 1 & 2 of Shaw, 1987). The revised matrix was analyzed using the Hennig86 program. Since the character list and matrix for the Euphorini is already published (Shaw, 1987), and all the character states for *Plynops* are given in the description below, the entire character list and matrix is not repeated here. The author will provide a diskette copy of the matrix to any interested reader.

PLYNOPS Shaw, New Genus

Head.—Ocular setae present; inter-ocular distance broad, shortest distance between eyes greater than clypeus width; median frontal carina absent; frontal sculpture punctate medially; antenna with 11–19 flagellomeres; apical flagellomere with tip rounded or tapering to a rounded apex, not acutely pointed; scape length short, 2.5× scape width or less; occipital carina complete; malar space very short, less than ¼ eye height; face and clypeus indented medially and weakly (males) to strongly (females) concave; facial concav-



Figs. 1-2. 1. Head of *Plynops hansonii*, anterior view. 2. Metasomal tergum 1 of *Plynops hansonii*, lateral view.

ity moderately to densely setose; mandible elongated, but curved apically, degree of mandibular overlap less than $\frac{1}{2}$ mandible

length; maxillary palpus 5-segmented; labial palpus 2-segmented.

Mesosoma.—Mesonotal disc nitid; notau-



Figs. 3-4. 3. Head of *Plynops braziliensis*, dorsal view. Note coarse surface sculpture extending to vertex. 4. Metasomal tergum 1 of *Plynops braziliensis*, dorsal view.

li indicated antero-laterally by coarse rugo-punctate sculpture, medially punctate; scutellar disc nitid; propodeal sculpture areolate; propodeum convex, without medial or posterior impression; petiolar notch absent; forewing vein R1 (metacarpus) desclerotized, absent except weak pigmentation basally; forewing vein 3RS (radius) desclerotized distally, free from wing margin; forewing vein 2RS (first intercubitus) absent, except for short free stub apically; forewing vein r-m (second intercubitus) absent; forewing vein RS+M (first cubital abscissa) strongly curved; forewing vein M (second cubital abscissa) absent distad of RS+M; forewing vein m-cu (recurrent) absent; forewing vein M+CU (medius) present; forewing vein 1cu-a (nervellus) postfurcal, relative to vein M (basal); forewing vein 2CUa (discoideus) varying from short stub (virtually absent) to well-developed; forewing vein 2Cub (subdiscoideus) absent; forewing vein 2-1A (brachius) absent; hindwing vein C+SC+R (costella and subcostella) absent; hindwing vein RS (radiella) absent; hindwing vein cu-a (nervellus) absent; hindwing vein A (submediella) absent; hind femur length/width ratio less than 6.

Metasoma.—Petiole of segment 1 with tergum and sternum not fused; petiolar sculpture rugo-costate; petiolar shape narrow, less than 3× broader apically than basally, at most $\frac{3}{4}$ as long as metasoma beyond petiole excluding ovipositor; glymma absent; petiolar spiracles anterior to middle of segment; tergite 2+3 length shorter than $\frac{3}{4}$ length of metasoma beyond petiole excluding ovipositor, several following segments exposed; syntergum 2+3 not overlapping ventrally; lateral fold of syntergum 2+3 absent; lateral suture on syntergum 2+3 absent (latero-tergites not differentiated); ovipositor and sheaths long and straight, varying from 0.4–2.3× metasoma length.

Phylogenetic considerations.—Phylogenetic analysis of the revised data matrix for

the tribe Euphorini resulted in one most parsimonious cladogram with a length of 109 and a consistency index of 54, as calculated by the "mhennig*" and "bb" options of the Hennig86 program. Aside from the insertion of *Plynops* as the sister-group of *Cryptoxilos*, the addition of this new genus did not alter the topology of the previously published cladogram for the Euphorini (Shaw, 1987). Application of successive approximations to character weighting (using the "m*; bb*; xs w; cc;" options) resulted in a single stable solution after two iterations, and that tree also had the same topology.

A sister-group relationship between *Plynops* and *Cryptoxilos* is indicated by five putative synapomorphies: forewing vein M+Cu present and somewhat curved, hindwing vein C+SC+R absent, metasomal syntergum 2+3 short, ovipositor long and straight, and ovipositor sheaths long. These conditions were previously interpreted as synapomorphies for *Cryptoxilos* species (Shaw, 1985), but the monophyly of *Cryptoxilos* is still indicated by the extremely narrow inter-ocular distance in females of that genus (the eyes are strongly convergent ventrally, and nearly touching).

The monophyly of *Plynops* is indicated by several putative synapomorphies: the extremely wide inter-ocular distance with the face broadly concave and densely setose, medially punctate frontal sculpture, strongly concave clypeus, mandible enlarged, presence of forewing vein 2CUa, and postfurcal position of forewing vein 1cu-a.

Discussion.—*Plynops* will key to subfamily Euphorinae without difficulty with existing keys to braconid subfamilies (e.g. M. Shaw & Huddleston, 1991; Sharkey, 1993; S. Shaw, 1995). In existing keys to genera (e.g. S. Shaw, 1985; Marsh *et al.*, 1987) *Plynops* will key to *Cryptoxilos*, from which it can be distinguished by the synapomorphic characters listed above.

The striking head modifications of fe-

male *Plynops* are so bizarre that it is tempting to speculate about their probable function, but aside from a few plant associations, nothing is known about the biology of *Plynops*. Since these head modifications are sexually dimorphic, being most strongly expressed in the female, it seems likely that these features are adaptations to grasping the host during oviposition. Other such unusual host-manipulating adaptations are known in the Euphorinae: females of *Cosmophorus* grasp their host with enlarged mandibles and females of *Streblocera* have raptorial antennae (Shaw, 1985). Presumably such adaptations would be useful for coping with adult host insects, which may be both highly mobile and densely sclerotized, as compared with immature hosts. The actual hosts of *Plynops* are unknown, but given the similarity of ovipositor form it seems reasonable to speculate that like its sister-group, *Cryptoxilos*, *Plynops* may attack small, densely sclerotized hosts such as adult bark beetles (Scolytidae). The association of one species with legume seeds suggests the possibility that bruchids may be attacked. Thus, the peculiar head of female *Plynops* may function as a "beetle clamp." The deep facial concavity, dense setal pads, associated carina, tubercles, and protuberances could all fit neatly over a small, cylindrical insect such as a bark beetle, while the enlarged mandibles

could function to clamp the host in place. The median facial carina of *Plynops carinatus*, new species, is oriented such that it might fit between the elytrae of a beetle host. At least one specimen examined here demonstrates the feasibility of this ovipositional method: a specimen of *Plynops edwardi*, new species, died with the ovipositor fully extended anteriorly, along the venter of the body. It runs between the coxae and anteriorly between the closed mandibles (see Fig. 10). If my "beetle clamp" hypothesis is correct, then the facial concavities of *Plynops* are unique features adapted to the parasitization of particular host species, and may possibly serve as a "lock and key" mechanism. It is hypothesized that the morphologically-based species proposed here will eventually be found to have separate hosts, which actually fit well into the unique facial concavities of each wasp species.

Etymology.—From the Greek *plynos* meaning basin, and the Greek *ops* meaning eye or face. The name *Plynops* refers to the basin-like concavity of the face, between the eyes, that characterizes this genus. The name was suggested to me by Dr. W.R.M. Mason.

Distribution.—Mostly Neotropical in distribution, the genus ranges from Mexico and southern Florida south to Peru and Brazil.

Type species.—*Plynops hansonii* Shaw, new species.

KEY TO THE KNOWN SPECIES OF *PLYNOPS*

- | | | |
|-------|---|---|
| 1 | Lateral portion of frons, on line directly between antennal insertion and median ocellus, coarsely punctate and dull (Fig. 3) | 2 |
| - | Lateral portion of frons, on line directly between antennal insertion and median ocellus, smooth and shining (Figs. 1, 5, 7, 9) | 5 |
| 2 (1) | Coarse rugo-punctate sculpture of frons ending roughly on line between lateral ocellus and compound eye, vertex smooth and shining; 15-19 flagellomeres | 3 |
| - | Coarse rugo-punctate sculpture of frons extending posteriorly to vertex, crossing well beyond line between lateral ocellus and compound eye, vertex partly rough and dull (Fig. 3); 13-14 flagellomeres | <i>Plynops braziliensis</i> Shaw, new species |
| 3 (2) | 15-16 flagellomeres | 4 |
| - | 18-19 flagellomeres | <i>Plynops megakephalos</i> Shaw, new species |

- 4 (3) Median area of facial concavity smooth and shining, without a vertical carina (Fig. 10) *Plynops edwardi* Shaw, new species
- Median area of facial concavity with a strong vertical carina narrowly bordered by coarse, dull punctation (Fig. 8) *Plynops carinatus* Shaw, new species
- 5 (1) Facial concavity dorsally margined by a carinate edge that separates the concavity from the frons (Fig. 12); area just below each antenna prolonged anteriorly as a roughly triangular projection, in dorsal view (Figs. 5, 7, 9) 6
- Facial concavity not margined dorsally, grading smoothly onto the frons; area just below each antenna not prolonged anteriorly 8
- 6 (5) Head, in dorsal view, with the dorsal margin of the facial concavity forming a U-shaped depression between the antennal insertions (Figs. 7, 9) 7
- Head, in dorsal view, with the dorsal margin of the facial concavity forming a V-shaped depression between the antennal insertions (Fig. 5) . . . *Plynops hansonii* Shaw, new species
- 7 (6) Triangular projection below antenna (in dorsal view) extending anteriorly beyond antennal insertion for a distance equal to *twice* the diameter of the antennal socket (Figs. 9) *Plynops riedeni* Shaw, new species
- Triangular projection below antenna (in dorsal view) extending anteriorly beyond antennal insertion for a distance equal to the diameter of the antennal socket (Fig. 7) *Plynops masoni* Shaw, new species
- 8 (5) Dorsal-lateral areas of facial concavity only sparsely setose; facial setae normal: short, straight, and not forming thick, brush-like pads; lower median area of facial concavity, near dorsal clypeal margin, either with a single triangular projection, or none; 10–11 flagellomeres 9
- Dorsal-lateral areas of facial concavity densely lined with long, curved setae forming thick, brush-like pads (Figs. 20–21); lower median area of facial concavity, near dorsal clypeal margin, produced into *two* sharp, thorn-like spines (Fig. 21); 12 flagellomeres *Plynops pilatus* Shaw, new species
- 9 (8) Mandible long and sickle-like (Figs. 6, 19); lower median area of facial concavity, near dorsal clypeal margin, with a single triangular projection (Fig. 19); face, in lateral view, with only a trace of a section visible in front of the eye, below the antenna, visible portion narrower than antennal socket (Fig. 18) *Plynops falcatus* Shaw, new species
- Mandible not so long and sickle-like (Fig. 17); lower median area of facial concavity, near dorsal clypeal margin, without a triangular projection (Fig. 17); face, in lateral view, with a distinct section visible in front of the eye, below the antenna, that is about as wide as antennal socket (Fig. 16) *Plynops minutus* Shaw, new species

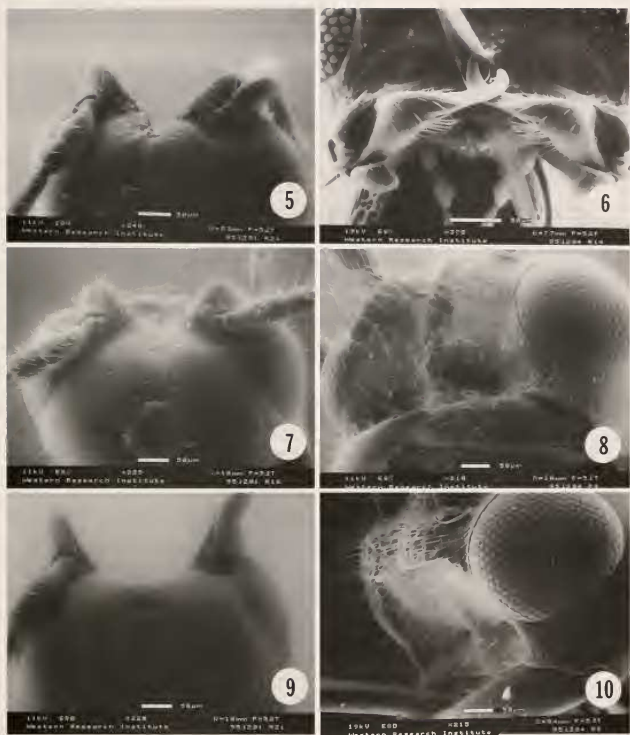
***Plynops braziliensis* Shaw, new species**
(Figs. 3–4)

Description of male.—Body length 2.0–2.3 mm; lateral portion of frons, on line directly between antennal insertion and median ocellus, coarsely rugo-punctate and dull; coarse rugo-punctate sculpture of frons extending posteriorly to vertex, crossing well beyond line between lateral ocellus and compound eye, vertex partly rugo-punctate and dull; 13–14 flagellomeres; forewing vein 2CUa well-developed, sclerotized portion about as long as hind coxa.

Color: head dark brown, except face yellowish brown; antenna yellowish brown basally, gradually darker brown apically; mandible yellowish brown, except tips reddish brown to black apically; palpi pale brownish white; mesosoma, wing venation, and metasoma dark chocolate brown; legs yellowish brown, except hind coxa basally and tips of tarsi dark brown.

Female.—Unknown.

Material Examined.—Holotype: male, Brazil, Nova Teutonia, 2.xi.1940, F. Plauermann, B.M. 1957–341, BMNH. Paratypes: 1 male, same data except 3.iv.1941,



Figs. 5–10. 5. Head of *Plynops hansonii*, dorsal view. 6. Mandibles of *Plynops falcatus* in closed position, anterior view. 7. Head of *Plynops masoni*, dorsal view. 8. Head of *Plynops carinatus*, antero-lateral view. 9. Head of *Plynops riedeni*, dorsal view. 10. Head of *Plynops edwardi*, antero-lateral view.

BMNH; 1 male, same data except 27°11'S, 52°23'W, 300–500m, 10.iii.1941, CNC.

Distribution.—At present known only from three specimens all from Nova Teutonia, Brazil. No other *Plynops* species have been recorded from Brazil.

Biology.—Unknown.

Remarks.—*Plynops braziliensis* can be distinguished from all other *Plynops* species by the more extensive coarsely rugo-punctate sculpture on the upper regions of the head (Fig. 3). Coarse rugo-punctate sculp-

ture of the lateral frons is a synapomorphy shared with three other species: *carinatus*, *edwardi*, and *megakephalos*, but none of these three has coarse rugo-punctate sculpture extending fully onto the vertex. Also, these three species have 15–19 flagellomeres, while *braziliensis* has 13–14 flagellomeres.

The recognition of *braziliensis* as a species poses a particular problem, since it is based entirely on males, while the three most closely related species are based entirely on females. Thus, it is impossible to judge to what extent the differences expressed in *braziliensis* may be due to sexual dimorphism, and the possibility that *braziliensis* is actually the male of another species cannot be totally ruled out. Nevertheless, the variation noted above, along with the widely separated distributions of the populations involved, indicates that the best course of action at present is to hypothesize this as a separate species.

Etymology.—Named for the type-locality.

***Plynops carinatus* Shaw, new species**
(Fig. 8)

Description of female.—Body length 2.7 mm; lateral portion of frons, on line directly between antennal insertion and median ocellus, coarsely rugo-punctate and dull; coarse rugo-punctate sculpture of frons ending roughly on line between lateral ocellus and compound eye, vertex smooth and shining; 16 flagellomeres; median area of facial concavity with a strong vertical carina narrowly bordered by coarse, dull punctation; forewing vein 2CUa well-developed, sclerotized portion about as long as hind coxa; ovipositor length 1.4× metasoma length.

Color: head and antenna dark chocolate brown, except pedicel yellowish brown; mandible yellow, except tips reddish brown to black apically; palpi pale brownish white; mesosoma, wing venation, and metasoma dark chocolate brown, except membranous ventral parts of metasoma

white; legs medium to dark brown, except coxa and trochanters pale brownish white.

Male.—Unknown.

Material Examined.—Holotype: female, Ecuador, Napo Province, Huahua Surnaco, km. 44 on Hollin-Loreto Road, xii.1989, MT (Malaise trap), M.J. Wasbauer, H. Real, CNC. Paratype: 1 female, Ecuador, Pastaza Province, 25 km. N. of Puyo, 1000m, montane moss forest, 4.vii.1976, S. & J. Peck, CNC.

Distribution.—Known only from Ecuador.

Biology.—Associated with montane moss forest.

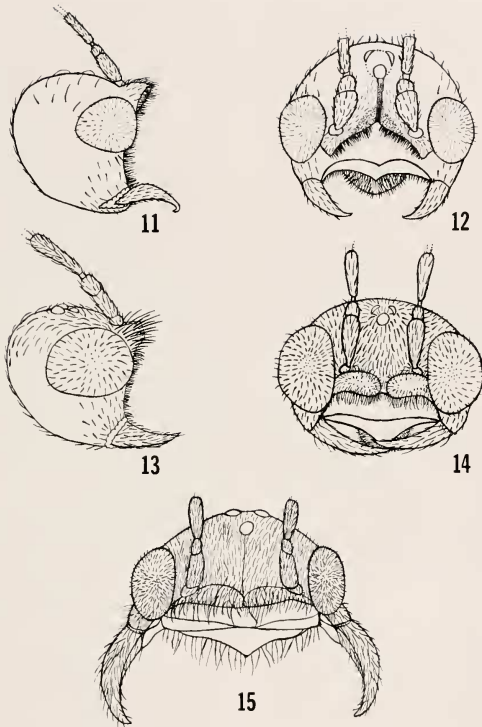
Remarks.—*Plynops carinatus* can be distinguished from all other *Plynops* species by the presence of a strong vertical carina, narrowly bordered by coarse, dull punctation, along the median area of the facial concavity (Fig. 8). In other respects it is quite similar to *Plynops edwardi* from Costa Rica, but that species lacks such a median carina, and the facial concavity is smooth and shining medially (Fig. 10). Also *Plynops carinatus* has darker leg coloration and the ovipositor is slightly shorter than in *Plynops edwardi*.

Etymology.—From the Latin *carina* for a ridge, in reference to the facial ridge that is diagnostic for this species.

***Plynops edwardi* Shaw, new species**
(Figs. 10, 13–14)

Description of female.—Body length 2.2–2.6 mm; lateral portion of frons, on line directly between antennal insertion and median ocellus, coarsely rugo-punctate and dull; coarse rugo-punctate sculpture of frons ending roughly on line between lateral ocellus and compound eye, vertex smooth and shining; 15–16 flagellomeres; median area of facial concavity smooth and shining, without a vertical carina; forewing vein 2CUa well-developed, sclerotized portion about as long as hind coxa; ovipositor length 1.5–2.3× metasoma length.

Color: head and antenna dark chocolate



Figs. 11-15. 11. Head of *Plynops hansonii*, lateral view. 12. Head of *Plynops hansonii*, anterior view. 13. Head of *Plynops edwardi*, lateral view. 14. Head of *Plynops edwardi*, anterior view. 15. Head of *Plynops megakephalos*, anterior view.

brown, except scape and pedicel yellowish brown; labrum yellow; mandible yellow, except tips reddish brown to black apically; palpi pale brownish white; mesosoma, wing venation, and metasoma dark chocolate brown, except membranous ventral

parts of metasoma white; legs light to medium brown, except coxa and trochanters white.

Male.—Unknown.

Material Examined.—Holotype: female, Costa Rica, Puntarenas Province, Golfo

Dulce, 24 km. W. Piedras Blancas, 200m, iii-vi.1990, P. Hanson, RMSEL. Paratypes: 1 female, same data; 1 female, same data except xii.1989-iii.1990; 1 female, same data except xii.1991; 1 female, same data except vii.1992; 1 female, Costa Rica, San Vito, Las Cruces, 17.viii-12.ix.1987, B. Gill. RMSEL, UCR.

Distribution.—Southern Costa Rica.

Biology.—Associated with moist primary tropical forest.

Remarks.—*Plynops edwardi* is similar to *Plynops carinatus* from Ecuador, but *edwardi* lacks a median facial carina (Fig. 10), and the facial concavity is smooth and shining medially (see Remarks above for *carinatus*).

Although not specifically mentioned on the labels, all the specimens from the Golfo Dulce site were sampled via Malaise traps. According to Prof. Hanson, the traps 24 kilometers west of Piedras Blancas were situated in the primary tropical forest at the Reserva Forestal Golfo Dulce, at coordinates of 8°46'N and 83°24'W. Originally one trap was placed about 50 meters down a trail into the primary forest, in a shaded situation. In October 1990 a second trap was situated at the very edge of the same forest. These traps were maintained locally by Maria Salablanca Nieto.

Etymology.—This species is named in honor of my father, Mr. Edward B. Shaw, of Boyne City, Michigan, in grateful recognition of his unswerving support for my entomological pursuits since early childhood. His assistance with acquiring and manufacturing nets, cages, and other collecting materials, along with leading collecting expeditions too numerous to count, were crucial elements in my advancement to a career as a naturalist, a scientist, and a professional entomologist.

***Plynops falcatus* Shaw, new species**
(Figs. 6, 18–19)

Description of female.—Body length 1.0–1.1 mm; lateral portion of frons, on line

directly between antennal insertion and median ocellus, smooth and shining; facial concavity not margined dorsally, grading smoothly onto frons; area just below each antenna not prolonged anteriorly; dorso-lateral areas of facial concavity only sparsely setose; facial setae normal: short, straight, and not forming thick, brush-like pads; lower median area of facial concavity, near dorsal clypeal margin, with single triangular projection; 11 flagellomeres; mandible long and sickle-like; face, in lateral view, with only a trace of a section visible in front of the eye, below the antenna, visible portion narrower than antennal socket; forewing vein 2CUa virtually absent, reduced to a short stub; ovipositor length 0.7–0.8× metasoma length.

Color: head dark chocolate brown, except antenna yellowish brown; mandible yellow, except tips reddish brown apically; palpi pale brownish white; mesosoma, pterostigma, and metasoma dark chocolate brown; wing venation and legs light yellowish brown.

Male.—Unknown.

Material Examined.—Holotype: female, Florida, Monroe County, Sugarloaf Key, Key Deer Refuge, SE1, S23, 6.vi-29.vii.1986, S.&J. Peck, 86–32, forest hammock Malaise, FIT, CNC. Paratype: 1 female, same data except S25, Kitchings, hardwood hammock forest, 26.ii-6.vi.1986, 86–29, CNC.

Distribution.—Known only from Sugarloaf Key, Florida. *Plynops falcatus* has the most restricted distribution of any known *Plynops* species.

Biology.—Associated with tropical hardwood forest vegetation (hammock) of the Florida Keys.

Remarks.—The exceptionally small body size and short ovipositor sets this species apart from other *Plynops*, with the exception of *Plynops minutus*. However, *Plynops falcatus* can be immediately distinguished from this and all other *Plynops* species by the presence of long and sickle-like mandibles (figs. 6, 19), and a single triangular

projection on the lower median area of the facial concavity, near the dorsal clypeal margin (Fig. 19).

Etymology.—From the Latin *falcatus* meaning "sickle-shaped," in reference to the form of the mandible.

***Plynops hansonii* Shaw, new species**
(Figs. 1–2, 5, 11–12, 22)

Description of female.—Body length 1.5–2.0 mm; lateral portion of frons, on line directly between antennal insertion and median ocellus, smooth and shining; facial concavity dorsally margined by a carinate edge that separates the concavity from the frons; area just below each antenna prolonged anteriorly as a roughly triangular projection (in dorsal view); head, in dorsal view, with the dorsal margin of the facial concavity forming a V-shaped depression between the antennal insertions; 11 flagellomeres; forewing vein 2CuA present as a short branch, sclerotized portion about $\frac{1}{2}$ as long as hind coxa; ovipositor length 0.7–0.9 \times metasoma length.

Color: head very dark brown to almost black; antenna dark chocolate brown, except scape and pedicel yellowish brown; mandible yellow, except tips reddish brown apically; palpi pale brownish white; mesosoma and metasomal tergum 1 very dark brown to almost black; wing venation, and remainder of metasoma dark brown, except membranous ventral parts of metasoma white; legs light to medium brown, except coxa and trochanters yellowish brown.

Male.—As female except body length shorter, 1.2 mm; face only slightly excavated and less densely setose, facial area lacking carinate margins and triangular projections; mandibles slightly shorter, less hooked apically; antenna and legs lighter, yellowish brown.

Material Examined.—Holotype: female, Costa Rica, Puntarenas Province, Road to Rincon, 10 km. west of Pan-American Highway, 100m, iii–v.1989, P. Hanson & I. Gauld, RMSEL. Paratypes: 3 females,

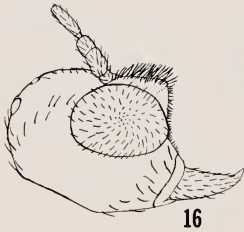
same data; 2 females, Costa Rica, Puntarenas Province, Reserva Forestal Golfo Dulce, 10 km. west of Piedras Blancas, 100m, vi–viii.1989, P. Hanson; 1 female, Costa Rica, Puntarenas Province, R.F. Golfo Dulce, 24 km. west of Piedras Blancas, 200m, vi–viii.1989, P. Hanson; 4 females, same data except xii.1991; 1 female, 1 male, same data except ii.1992; 9 females, same data except x–xi.1992; 2 females, Costa Rica, Puntarenas Province, Golfo Dulce, 5 km. west of Piedras Blancas, 100m, xi.1990, P. Hanson; 2 females, same data except xii.1990; 1 female, Costa Rica, Puntarenas Province, R.F. Golfo Dulce, 3 km. SW. Rincon, 10m, ii.1992, P. Hanson; 7 females, Puntarenas Province, P.N. Corcovado, Est. Sirena, 50m, x–xii.1990. RMSEL, UCR.

Distribution.—Various sites in Puntarenas Province, Costa Rica.

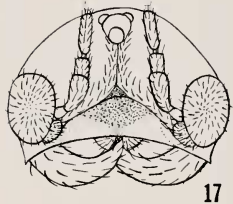
Biology.—Associated with moist primary tropical forest habitats at elevations from 10–200 meters on the Osa Peninsula.

Remarks.—*Plynops hansonii* is one of three species that have a pronounced synapomorphic triangular (in dorsal view) projection below each antenna, the other two being *Plynops masoni* and *Plynops riedeni* (see Figs. 5, 7, 9). *Plynops hansonii* can be distinguished from these, and all other *Plynops* species, by the profile of the space between these projections, which in dorsal view is distinctly V-shaped (Fig. 5). The profile of this space is U-shaped in both *Plynops masoni* and *Plynops riedeni* (Fig. 7, 9).

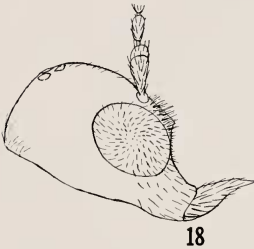
All of the specimens of *Plynops hansonii* were sampled via Malaise traps set by Prof. Paul Hanson, on, or in route to, the Osa Peninsula. The traps situated 24 kilometers west of Piedras Blancas are discussed above, under *Plynops edwardi*. The trap located 10 kilometers west of Piedras Blancas (=10 km. W. of Pan-American Highway) was situated at coordinates of 8°45'N and 83°18'W, placed just inside a primary forest, at a mostly shaded site. This trap was destroyed by a fallen tree



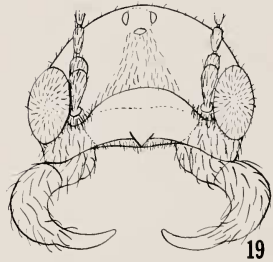
16



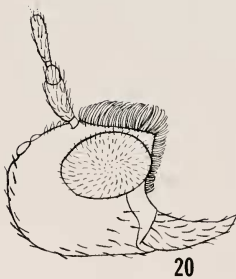
17



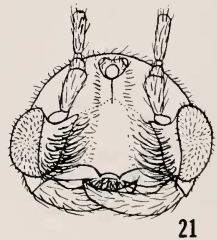
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21

Figs. 16-21. 16. Head of *Plynops minutus*, lateral view. 17. Head of *Plynops minutus*, anterior view. 18. Head of *Plynops falcatus*, lateral view. 19. Head of *Plynops falcatus*, anterior view. 20. Head of *Plynops pilatus*, lateral view. 21. Head of *Plynops pilatus*, anterior view.

after 1–2 years of operation. The trap located 3 kilometers southwest of Rincon was situated at the edge of a primary forest, and was maintained by Moises Perez Parra and family.

Etymology.—This species is named in honor of Professor Paul Hanson, of the Universidad de Costa Rica, at San Pedro, in appreciation for several years devoted to the maintenance of Malaise traps, and subsequent sorting of samples too numerous to count. Without his collaboration, five of the species treated here (including this species), would not have been available for study.

***Plynops masoni* Shaw, new species**
(Figs. 7)

Description of female.—Body length 1.6–1.9 mm; lateral portion of frons, on line directly between antennal insertion and median ocellus, smooth and shining; facial concavity dorsally margined by a carinate edge that separates the concavity from the frons; area just below each antenna prolonged anteriorly as a roughly triangular projection (in dorsal view); head, in dorsal view, with the dorsal margin of the facial concavity forming a U-shaped depression between the antennal insertions; triangular projection below antenna (in dorsal view) extending anteriorly beyond antennal insertion for a distance equal to the diameter of the antennal socket; 11 flagellomeres; sclerotized vein 2CUa reduced to a short stub, sclerotized portion about $\frac{1}{8}$ as long as hind coxa; ovipositor length 0.5–0.9 \times metasoma length.

Color: head reddish brown, except facial concavity yellowish brown; antenna medium brown, except scape and pedicel yellowish brown; mandible yellow, except tips reddish brown apically; palpi pale brownish white; mesosoma, wing venation, and metasomal tergum 1 dark reddish brown; remainder of metasoma dark brown to yellowish brown, except membranous ventral parts of metasoma white; legs light to medium brown, except coxa

and trochanters yellowish brown to yellowish white.

Male.—Unknown.

Material Examined.—Holotype: 1 female, Ecuador, Pichincha, 47 km. S. Santo Domingo de los Colorados, Rio Palenque Station, Pacific lowland rainforest, 1–14.vii.1975, A. Forsyth, CNC. Paratype: 1 female, same data except 200m, vi.1976, Peck, CNC.

Distribution.—Known only from the type-locality in Pichincha, Ecuador.

Biology.—Associated with Pacific lowland rainforest.

Remarks.—*Plynops masoni* is similar to *Plynops riedeni* from Costa Rica, but differs from that species by having much shorter triangular projections below the antennae (Fig. 7).

Etymology.—This species is named in honor of Dr. W.R.M. Mason in recognition of his many contributions to the study of braconid wasps, and in appreciation for first calling to my attention this interesting new genus.

***Plynops megakephalos* Shaw, new species**
(Figs. 15)

Description of female.—Body length 2.7–3.9 mm; lateral portion of frons, on line directly between antennal insertion and median ocellus, coarsely rugo-punctate and dull; coarse rugo-punctate sculpture of frons ending roughly on line between lateral ocellus and compound eye, vertex smooth and shining; 18–19 flagellomeres; forewing vein 2CUa well-developed, sclerotized portion slightly longer than hind coxa; ovipositor length 1.5–1.6 \times metasoma length.

Color: head very dark chocolate brown, nearly black; antenna dark brown, except scape, pedicel, and apical 6 flagellomeres yellowish brown; labrum yellowish brown; mandible yellowish brown, except tips reddish brown to black apically; palpi pale brownish white; mesosoma, wing venation, and metasoma very dark chocolate

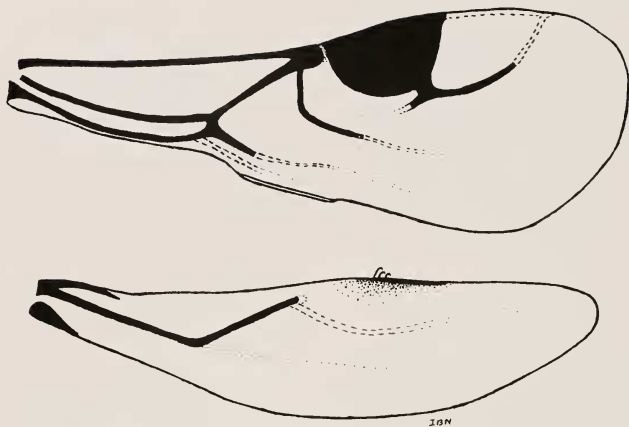


Fig. 22. Wings of *Plymops hansonii*.

brown to nearly black; legs medium to dark brown, except coxa and trochanters light brownish white.

Male.—Unknown.

Material Examined.—Holotype: female, Costa Rica, Heredia, Estacion Biologia La Selva, 50–150m, 10°26'N, 84°01'W, 2.v.1993, INBio-OET, bosque primario, M/05/084, INBio Barcode CR1001-227693, INBio. Paratype: 1 female, same data except 2.iv.1993, M/05/052, INBio Barcode CR1001-239856, INBio.

Distribution.—Known only from the type-locality at the La Selva Biological Station, Heredia Province, Costa Rica.

Biology.—Associated with moist primary tropical forest.

Remarks.—Coarse rugo-punctate sculpture of the lateral frons is a synapomorphy shared with three other species: *braziliensis*, *carinatus*, and *edwardi*, but *Plymops megakephalos* can be distinguished from these, and all other *Plymops* species, by its large body size, exceptionally broad head (Fig.

15), and long flagellum. *Plymops megakephalos* has more flagellomeres (18–19) than any other *Plymops* species.

These specimens were collected during the ALAS Project (Arthropods of La Selva), but they were recognized as *Plymops* and brought to my attention by Geraldine Wright and Carlie Miller who were studying in Costa Rica during the summer of 1994, with support from an NSF-REU grant.

Etymology.—Derived from the Greek *megakephalos*, meaning “large-headed.”

***Plymops minutus* Shaw, new species**
(Figs. 16–17)

Description of female.—Body length 0.9–1.6 mm; lateral portion of frons, on line directly between antennal insertion and median ocellus, smooth and shining; facial concavity not margined dorsally, grading smoothly onto the frons; area just below each antenna not prolonged anteriorly; dorso-lateral areas of facial concavity only

sparsely setose; facial setae normal: short, straight, and not forming thick, brush-like pads; lower median area of facial concavity, near dorsal clypeal margin, without a triangular projection; mandibles not long and sickle-like; face, in lateral view, with a distinct section visible in front of the eye, below the antenna, that is about as wide as antennal socket; 11 flagellomeres; forewing vein present as a short branch, sclerotized portion about $\frac{1}{4}$ as long as hind coxa; ovipositor length $0.4\text{--}1.3\times$ metasoma length.

Color: head dark chocolate brown to nearly black, except antenna yellowish brown to brown; mandible yellow, except tips reddish brown apically; palpi pale brownish white; mesosoma, pterostigma, and metasoma dark chocolate brown to nearly black; wing venation and legs medium to dark brown.

Male.—As female except face less strongly excavated; body length 1.2 mm; 10 flagellomeres; antenna and legs lighter, yellowish brown.

Material Examined.—Holotype: female, Costa Rica, Puntarenas Province, Golfo Dulce, 3 km. SW. Rincon, 10m, xii.1989-iii.1990, P. Hanson, RMSEL. Paratypes: 1 female, Mexico, Nogales, 8.v.1953, with *Canavalia* seeds, 72857, n.g. near *Euphorus* det. Mues., USNM; 1 female, Peru, Madre de Dios, Puerto Maldonado, 6-11.i.1984, L. Huggert, CNC; 1 female, Costa Rica, Heredia Province, Puerto Viejo, OTS, La Selva, 100m, iv.1991, P. Hanson, UCR; 1 female, Costa Rica, Puntarenas Province, Peninsula Osa, Puerto Jimenez, 10m, vi.1991, P. Hanson, grassy, weedy site, UCR; 1 male, same locality as holotype except ii-iii.1989, P. Hanson & I. Gauld, RMSEL.

Distribution.—This species has the broadest distribution of any *Plynops* species, ranging from Central America (Mexico and Costa Rica) to Peru.

Biology.—The Mexican specimen is associated with seeds of *Canavalia* (jack bean), a member of the Leguminosae. The

species occurs in habitats ranging from shaded, moist, primary forests, to very disturbed, sunny, weedy sites.

Remarks.—This tiny species is similar to *Plynops falcatus*, which also has a very small body size and short ovipositor. *Plynops minutus* differs from *falcatus* in the form of the mandibles, which are not so strongly sickle-shaped (Fig. 17), by lacking a triangular projection medially in the facial concavity (Fig. 17), and by having the lateral borders of the face, below the antenna, more noticeably protruding in lateral profile (Fig. 16).

The Costa Rican specimens were all collected by Malaise traps set by Prof. Paul Hanson. The trap located 3 kilometers southwest of Rincon was situated within a, more or less, primary forest (the understory at this site was cleared) on a very steep, shaded slope. The trap at La Selva was situated within a virgin primary forest. In stark contrast to these, the trap at Puerto Jimenez was located in full sun, in a grassy, extremely disturbed site with weedy bushes and trees nearby. Judging from these collecting sites, it appears that *Plynops minutus* is adapted to a broader range of habitats than other *Plynops* species, which may account for its broader distribution.

Etymology.—Derived from the Latin *minutus*, meaning "little."

***Plynops pilatus* Shaw, new species**
(Figs. 20-21)

Description of female.—Body length 2.2 mm; lateral portion of frons, on line directly between antennal insertion and median ocellus, smooth and shining; facial concavity not margined dorsally, grading smoothly onto the frons; area just below each antenna not prolonged anteriorly; dorso-lateral areas of facial concavity densely lined with long, curved setae forming thick, brush-like pads; lower median area of facial concavity, near dorsal clypeal margin, produced into two sharp, thorn-like spines; 12 flagellomeres; fore-

wing vein 2CUa present as a short branch, sclerotized portion about $\frac{1}{4}$ as long as hind coxa; ovipositor length $0.8 \times$ metasoma length.

Color: head dark chocolate brown; antenna dark brown, except scape and pedicel yellowish brown; mandible yellow, except tips reddish brown apically; palpi pale brownish white; mesosoma, pterostigma, wing venation, and metasoma dark chocolate brown; legs medium yellowish brown.

Male.—Unknown.

Material Examined.—Holotype: female, Costa Rica, San Jose Province, San Antonio de Escazu, 1300m, iv.1987, Col. W. Eberhard, RMSEL.

Distribution.—Known only from the type-locality in Costa Rica.

Biology.—Unknown.

Remarks.—*Plynops pilatus* can be distinguished from all other *Plynops* species by the presence of thick, brush-like setal pads on the dorso-lateral areas of the facial concavity (Figs. 20–21), and also by the presence of two sharp, thorn-like spines on the lower median area of facial concavity, near dorsal clypeal margin (Fig. 21).

Etymology.—From the Latin *pilatus*, meaning "grown hairy."

***Plynops riedeni* Shaw, new species**
(Figs. 9)

Description of female.—Body length 1.8–2.1 mm; lateral portion of frons, on line directly between antennal insertion and median ocellus, smooth and shining; facial concavity dorsally margined by a carinate edge that separates the concavity from the frons; area just below each antenna prolonged anteriorly as a roughly triangular projection (in dorsal view); head, in dorsal view, with the dorsal margin of the facial concavity forming a U-shaped depression between the antennal insertions; triangular projection below antenna (in dorsal view) extending anteriorly beyond antennal insertion for a distance equal to twice the diameter of the antennal socket; fore-

wing vein 2CUa present as a short branch, sclerotized portion about $\frac{1}{4}$ as long as hind coxa; ovipositor length $0.9\text{--}1.3 \times$ metasoma length.

Color: head very dark brown to almost black, except triangular projections and lower $\frac{1}{2}$ of facial concavity yellowish brown; antenna dark chocolate brown, except scape and pedicel yellowish brown; mandible yellow, except tips reddish brown apically; palpi pale brownish white; mesosoma and metasomal tergum 1 very dark brown to almost black; wing venation, and remainder of metasoma dark brown, except membranous ventral parts of metasoma white; fore leg yellowish brown; middle and hind legs light to medium brown, except coxa and trochanters yellowish brown.

Male.—Unknown.

Material Examined.—Holotype: female, Costa Rica, Heredia Province, 3 km. S. Puerto Viejo, OTS, La Selva, 100m, ii–iii.1993, P. Hanson, RMSEL. Paratype: female, Costa Rica, Alajuela Province, $10^{\circ}27'N$, $84^{\circ}05'W$, Los Chiles de Aguas Zarcas, cafe, 300m, xi.1989, mixed coffee plantation, R. Cespedes, UCR.

Distribution.—This species is known only from two sites in Costa Rica, on the northern part of the Caribbean coastal plain.

Biology.—Recorded from both moist primary forest at La Selva, and a mixed coffee plantation at Los Chiles de Aguas Zarcas.

Remarks.—*Plynops riedeni* is one of three species that have a pronounced triangular (in dorsal view) projection below each antenna, the other two being *Plynops masoni* and *Plynops hansonii*. *Plynops riedeni* can be distinguished from these, and all other *Plynops* species, by the exceptionally large size of the triangular projection below the antenna, which extends anteriorly beyond antennal insertion for a distance equal to twice the diameter of the antennal socket (Fig. 9).

Etymology.—This species is named in

honor of my father-in-law, Dr. James A. Rieden, of Bloomfield Hills, Michigan.

ACKNOWLEDGMENTS

The following collections and curators provided specimens for this study:

- BMNH The Natural History Museum, London (T. Huddleston)
 CNC Canadian National Collection, Ottawa (M. Sharkey)
 INBio Instituto Nacional de Biodiversidad, Heredia (J. Ugalde)
 RMSEL Rocky Mountain Systematic Entomology Laboratory, University of Wyoming, Laramie (S. Shaw)
 UCR Universidad de Costa Rica, San Jose (P. Hanson)

This research was supported by grant DEB-930-0517 from the National Science Foundation. Additional support was provided by a 1994 supplemental REU grant (Research Experience for Undergraduates). Support was also provided by a Faculty Grant-in-Aid from the University of Wyoming Office of Research.

Special thanks are due to Ms. Isobel Nichols for preparation of the ink illustrations (Figs. 11-22), and also to Ms. Teresa Williams, of the Western Research Institute, for assistance with the Environmental Scanning Electron Microscope and photography on Figs. 3-10. Dr. Paul Marsh assisted with scanning electron microscopy on Fig. 1. Dr. Stewart Peck provided corrections and additional information on his collecting sites in Ecuador and Florida.

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